

CLAIMS

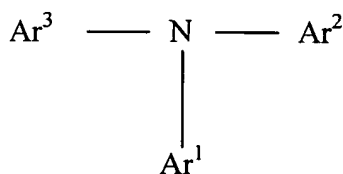
1. (currently amended) A composite structure~~[, the structure]~~ comprising:
a dual-function material intermediate a conducting material and a semiconductor;
wherein the conducting material comprises at least one of an ohmic conductor, a semiconducting material ~~[or]~~ and an ionic conductor; and
wherein the dual-function material comprises an organic material and at least one ionic species~~[[;]]~~, said organic material comprising at least one moiety represented by the general formula (I):



(I)

wherein [Y] comprises an organic semiconductor; and wherein X comprises an ion-chelating group, said organic material having both electronic charge transport properties and supporting or chelating the at least one ionic species.

2. (currently amended) ~~[A]~~ The structure ~~[according to]~~ of claim 1, wherein [Y] comprises a moiety represented by the general formula (II):



(II)

wherein Ar¹, Ar² and Ar³ are independently substituted or unsubstituted aromatic or hetero-aromatic rings or fused or ~~[otherwise]~~ conjugated derivatives thereof.

3. (currently amended) [A] The structure [~~according to~~] of claim 1, wherein [Y] comprises at least one of poly(1,4-phenylene), polypyrrole, poly(p-phenylenevinylene) (PPV), poly(thiophene), MEH-PPV, polyaniline [~~or~~] and PEDOT.

4. (currently amended) [A] The structure [~~according to any of claims 1 to 3~~] of claim 1, wherein X comprises at least one [~~group selected from~~] of: $[-(\text{CH}_2\text{CH}_2\text{O})_n\text{CH}_2\text{CH}_2\text{OCH}_3]$, $[-(\text{OCH}_2\text{CH}_2)_n\text{OCH}_3]$, $[-(\text{CH}_2\text{CH}(\text{R})\text{O})_n\text{CH}_2\text{CH}_2\text{OCH}_3]$ and $[-(\text{OCH}(\text{R})\text{CH}_2)_n\text{OCH}_3]$; wherein n is an integer[~~, preferably~~] of 2 to 10[~~, more preferably 2 to 4~~]; wherein R is straight or branched alkyl chain of 1 to 10 carbon atoms[~~, preferably of 1 or 2 carbon atoms~~].

5. (currently amended) [A] The structure [~~according to any of claims 1 to 3~~] of claim 4, wherein X comprises at least one of a crown ether, a podand, a lariat ether, a cryptand [~~or~~] and a spherand.

6. (currently amended) [A] The structure [~~according to any preceding~~] of claim 1, wherein the at least one ionic species is [~~chosen from~~] selected from the group consisting of: Li^+ , Na^+ , K^+ , Cs^+ , Mg^{2+} , Ca^{2+} , triflimide, halide, perchlorate, trilate and BARF salts of [~~the above cations~~] Li^+ , Na^+ , K^+ , Cs^+ , Mg^{2+} , Ca^{2+} .

7. (currently amended) [A] The structure [~~according to any preceding~~] of claim 1, wherein the conducting material comprises an ohmic conductor and is [~~chosen from~~] at least one of: a metal, graphite, a highly-doped semiconductor and an organic conductor.

8. (currently amended) [A] The structure [~~according to any of claims 1 to 6~~] of claim 1, wherein the conducting material comprises a semiconducting material [~~and is chosen from~~] being at least

Applicants : James Robert Durrant et al
Page No. : 4

one of: TiO₂, ZnO, SnO, Ta₂O₅, Nb₂O₅, WO₃, OMeTAD, PPV, Cu-phthalocyanin, polythiophenes, polypyrroles, pentacene and perylenes.[[·]]

9. (currently amended) [A] The structure ~~[according to any of claims 1 to 6]~~ of claim 1, wherein the conducting material comprises an ionic conductor and is ~~[chosen from]~~ at least one of: a polymer electrolyte, and a polymer supporting a redox active species.

10. (currently amended) [A] The structure ~~[according to any preceding]~~ of claim 1, wherein the semiconductor is ~~[chosen from]~~ at least one of: TiO₂, ZnO, SnO, Ta₂O₅, Nb₂O₅, WO₃, OMeTAD, PPV, Cu-phthalocyanin, ~~[oligo- or]~~ oligothiophenes, polythiophenes, polypyrroles, TPDs, pentacene and perylenes.

11. (currently amended) [A] The structure ~~[according to any preceding]~~ of claim 1, wherein the semiconductor is porous and the dual-function material is at least partially contained within the pores of the semiconductor.

12. (currently amended) An electrochemical device~~[, the device]~~ comprising:
a structure ~~[according to any preceding claim and one further, or]~~ including a dual-function material intermediate a conducting material and a semiconductor;
wherein the conducting material comprises at least one of an ohmic conductor, a semiconducting material and an ionic conductor; and
wherein the dual-function material comprises an organic material and at least one ionic species,
said organic material comprising at least one moiety represented by the general formula (I):

[Y]-X

(I)

Applicants : James Robert Durrant et al
Page No. : 5

wherein [Y] comprises an organic semiconductor; and wherein X comprises an ion-chelating group, said organic material having both electronic charge transport properties and supporting or chelating the at least one ionic species; and

at least two external ohmic conductors [~~such that the device is provided with two external ohmic conductors~~] in electrical communication with the structure.

13. (currently amended) A photo-voltaic cell~~[, the cell]~~ comprising:

a structure ~~[according to any of claims 1 to 11]~~ including a dual-function material intermediate a conducting material and a semiconductor;

wherein the conducting material comprises at least one of an ohmic conductor, a semiconducting material and an ionic conductor; and

wherein the dual-function material comprises an organic material and at least one ionic species, said organic material comprising at least one moiety represented by the general formula (I):



(I)

wherein [Y] comprises an organic semiconductor; and wherein X comprises an ion-chelating group, said organic material having both electronic charge transport properties and supporting or chelating the at least one ionic species.

14. (currently amended) ~~[A]~~ The device [according to] of claim 12 [which is] wherein the structure and at least two ohmic conductors are included in at least one of a photodiode, a battery, an electrode, an electrochromic device [~~or~~] and a light-emitting diode.